ZÁPADOČESKÁ UNIVERZITA V PLZNI

HODNOCENÍ ŠKOLITELE

STUDENTA V DOKTORSKÉM STUDIJNÍM PROGRAMU Fakulty strojní na Západočeské univerzitě v Plzni

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Student Junhong Cheon was born in Korea in 1980 and he studied at the Yonsei University in Korea, where he graduated in mechanical engineering (bachelor degree, 2006) and he completed his Master degree in energy engineering at Pusan National University in 2008.

Student Junhong Cheon joined at Doosan heavy industries and construction in 2005 and moved to global turbine R&D center of Doosan Škoda Power in 2013 as a position of R&D specialist in flow path design. In 2015, he started a doctorial study at the department of power system engeering. He has developed the performance estimation system in steam turbine and performed the 1D meanline, 2D through flow and 3D CFD analysis. Also he designed flow-path of HP, IP and LP steam turbines.

His dissertation descibes a method for prediction of energy losses in a turbine cascade. In this area, there are many published researches using empirical correlations from the past to the present. However, it showed surprisingly large deviations among them. Therefore, his dissertation focused on the new physical based loss estimation methods using the concept of entropy generation, a number of detailed numerical calculation data and experimental data. In the first part, the dissertation presented profile losses. The method encompass the basic profile loss, i.e. losses due to the blade surface friction, an additional loss due to mixing behind the trailing edge and off-design incidence loss. The influence of the Reynolds number was also considered. A review of the existing profile loss and the comparison with experimental are presented. In the second part, the dissertation presented estimation methods for secondary losses using numerical calculation. To do this, 3D CFD code validated against with public experiment data performed by Harrison. During this validation, 3D CFD calculation method set up to obtain reasonable agreement by adjusting the turbulence model (SST model and transitional SST model) and the state of the inlet boundary layer (constant total pressure and profiled total pressure from measurement data). And inlet loss due to the inlet boundary layer was separated from the other loss terms using boundary layer concept. The effects of blade geometry(aspect ratio, contraction ratio, deflection angle and blade loading) and flow conditions (Reynolds and Mach number) in secondary loss was researched. In addition, the effects of downstream distance was considered. Finally, a simple correlation for secondary loss estimation was compared with public test data. The results show a good agreement between the estimated value using new correlated model and test results within $\pm$ 0.5%.

During his Ph.D study, he published "Flow Mechanism by Tangential Lean in Stationary Blade for Steam Turbine Application„ at 13th conference on power system engineering(Plzen, Czech Republic) and "Reaction Technology Development for Increasing Performance of Steam Turbines„ at Doosan technical forum (Seoul, Korea). In 2015, he presented "Off Design Incidence Loss Prediction for Steam Turbines„ at 14th conference on power system engineering(Plzen, Czech Republic) and "Numerical Study of Reynolds Number Effects on Steam Turbine Performance„ at ASME turbo expo(Montreal, Cannada). In 2016, he presented "Profile Loss Prediction for High Pressure Steam Turbines„ at ASME turbo expo(Seoul, Korea)

In point of my view, this dissertation is high level of maturity and he carried out all tasks successfully. Therefore, I recommend the dissertation to defense.

prof. Ing. Miroslav Šťastný, DrSc.
Školitel